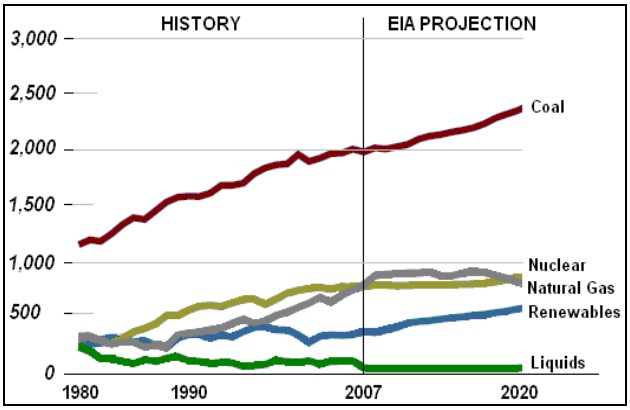
APP Energy Regulatory and Market Development Forum
June 27, 2008
Workshop on Clean Energy Policy, Initiatives and Regulation Experience

Good afternoon. I am Mark Whitenton, Deputy Assistant Secretary in the Office of Electricity of the United States Department of Energy. Thank you for the opportunity to participate in this important discussion.

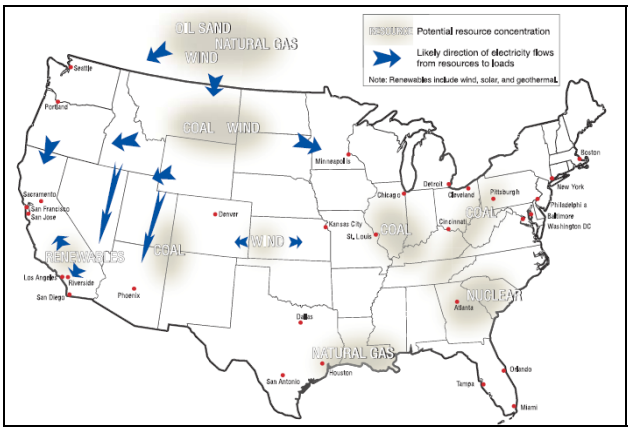
In the United States, there has been a growing consensus toward a common goal of increasing the use of clean energy to generate our electricity. Of course, using electricity more efficiently is equally necessary to achieve the goal of decreasing our environmental impact from electricity generation.

In the effort to use electricity more efficiently and slow demand growth, the Department of Energy (the Department) strongly supports energy conservation, demand response initiatives and implementation of smart grid technologies. Although U.S. electricity demand growth has slowed over the past several decades, the Department's Energy Information Administration still expects a 25 percent increase in electricity demand by 2030. This means over 1,500 gigawatts of generating capacity will have to be added within the next 22 years in order to meet new demand with adequate reserve margins. Additional generation will also be needed to replace older power plants scheduled for retirement.



Electricity Generation by Fuel 1980 - 2020
(billion kilowatthours)
Source: EIA Annual Energy Outlook 2008

Our challenge at the Federal, State, and regional levels, is to provide the appropriate policies and incentives that will increase the role of clean energy generation necessary to meet our future electricity needs. The importance of this effort is increased by the possibility that new regulations to restrict air pollution and carbon emissions could raise the costs of operating and retrofitting the existing fleet of coal-fired generation facilities – which could significantly accelerate retirements of older coal plants.

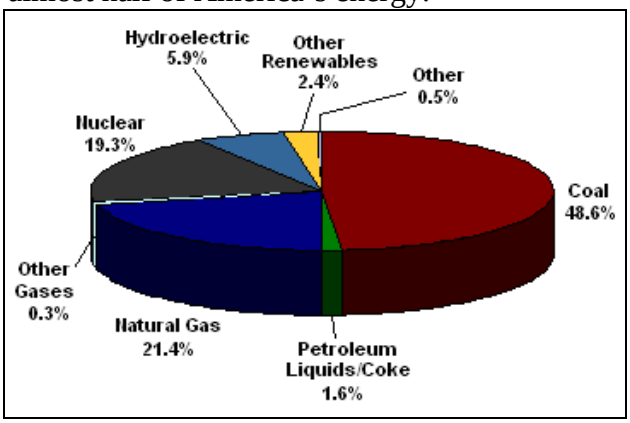


Potential Transmission Constraints
Source: DOE National Electric Transmission Congestion Study

In recent decades, the United States has generally relied on the private sector to build new generation facilities. However, the electricity market is facing several new obstacles including rising construction costs, siting issues, impact on grid operations, and concerns regarding fuel prices and availability. Other challenges involve regulatory uncertainties, particularly pertaining to the potential for new carbon and air pollution costs. At the moment, natural gas is the fuel of choice, experiencing higher capacity additions during the past five years. New wind generation is also being planned and built aggressively, but most of the larger wind farms and solar generation sites will require new transmission to bring that power to consumers.

COAL

Coal has remained the most widely used base-load fuel for electricity generation and continues to provide almost half of America's energy.



U.S. Net Generation by Energy Source, 2007
(Source: EIA Annual Energy Outlook 2008)

Most of the coal facilities operating in the United States today were built before 1990. Construction of new coal-fired power plants has been facing increasing obstacles, including uncertainties regarding future carbon and environmental costs, higher construction costs, and skilled labor shortages. Consequently, coal generation only increased by 2.7 percent between 2000 and 2007.

Perhaps the most serious of these challenges is the potential costs of future regulatory requirements. The structure of future regulations aimed at reducing carbon emissions is not known at this time. Different proposals could have highly varied impacts, on both the existing and the future electricity generation fleet. Similarly, there is potential for new Federal environmental regulations of mercury emissions from coal plants and new standards for water cooling towers that could adversely affect the economics of coal facilities. These regulatory uncertainties, combined with the substantial increases in construction costs, and persistent targeting by some environmental groups, have resulted in the abandonment of several major proposals for new coal plants in the past few years.

The United States is investing heavily in developing advanced clean energy technologies, including clean coal technologies with carbon capture and sequestration (CCS). By capturing and permanently storing carbon from coal-fired facilities before it is emitted into the atmosphere, CSS would the United States – and other coal-using countries – to continue to use this relatively inexpensive and abundant resource without adding to the carbon dioxide load in the atmosphere. Although CCS is not yet commercial, and may not be available for some time, this technology holds great potential to provide clean energy from coal for the long-term.

NUCLEAR

Nuclear power has been a vital base-load source of electricity generation in the United States since the early 1960s. Currently, 104 operating nuclear power reactors supply about 19 percent of the United States' total generation. Aggressive efforts have been undertaken to increase the output from these plants, resulting in an average capacity factor (the percentage of time a facility is operating) of approximately 90 percent, almost 20 percent higher than a decade ago.

However, the most recent nuclear power plant was put into commercial operation in 1996. A quick rebirth of nuclear infrastructure in the United States will not be accomplished easily. Recent rapid increases in industry construction costs represent a challenge for nuclear facility developers. Industry sources have projected that the next nuclear plant will not come online until at least 2014. EIA projects 10.7 GW of additional nuclear generation capacity by 2020.

Given the uncertainties of risks associated with constructing large-scale base-load generation capacity during the next 15 years, it is clear that expanding capacity to meet new demand and replace retired facilities will require increased construction of natural gas, wind, and other renewable generation.

NATURAL GAS

Natural gas-fired facilities have several advantages over coal-fired plants, including lower air pollution and CO_2 emissions, shorter construction times, lower construction costs, and smaller site footprints. Unlike base-load coal and nuclear facilities, natural gas-fired power plants are ideal for responding quickly to abruptly changing electricity demands such as those related to peak load periods or the need to balance intermittent renewable resources, especially wind and solar. Newer combined-cycle facilities utilize

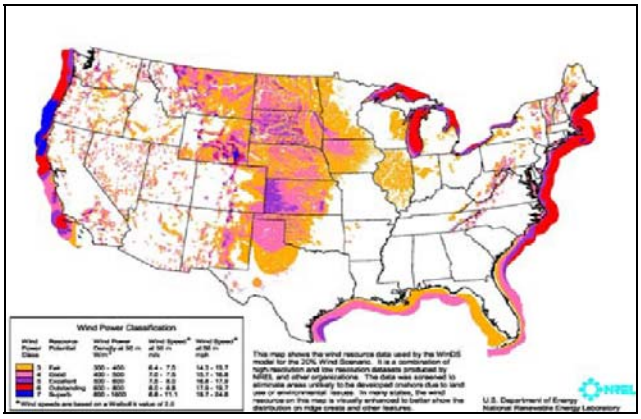
natural gas efficiently and are capable of running more hours than mere peaking units. These attractive features have resulted in a 64 percent increase in natural gas consumption to generate electricity over the past decade. In 2007, the United States consumed 6.8 Tcf of natural gas for electricity generation, or approximately one-third of the total natural gas consumed that year. Today, natural gas-fired power plants contribute approximately one-fifth of America's overall electricity generation.

Historically, natural gas consumed in the U.S. has been primarily met by a steady supply of domestic production augmented by imports from Canada along with some LNG imports. However, more liquefied natural gas (LNG) imports will be necessary considering that over 96 percent of the world's proven reserves are located in other countries. Although domestic production has recently begun to rise, primarily due to new technologies applied to natural gas-bearing shale formations, the U.S. will need to look to overseas markets for future LNG imports for natural gas to maintain EIA's projected 20 to 21 percent share of the nation's fuel mix through 2017.

The United States has ample LNG importing capacity, but the availability and price of future LNG imports will likely be determined by how much new liquefaction capacity is brought online throughout the world. It is of concern that in 2007, LNG prices climbed 19 percent over the previous year.

WIND

The United States has had the fastest growing wind sector in the world for the last three years – increasing by 27 percent in 2006 alone. Eighty-five percent of the total wind capacity in the United States has been installed since President Bush took office in January 2001. By the end of 2009, the United States is likely to become the world leader for installed wind capacity. Thanks largely to wind energy's contribution, renewable energy accounted for 30 percent of all new nameplate electricity capacity additions in the U.S. in 2007 – up from just 2 percent in 2004.

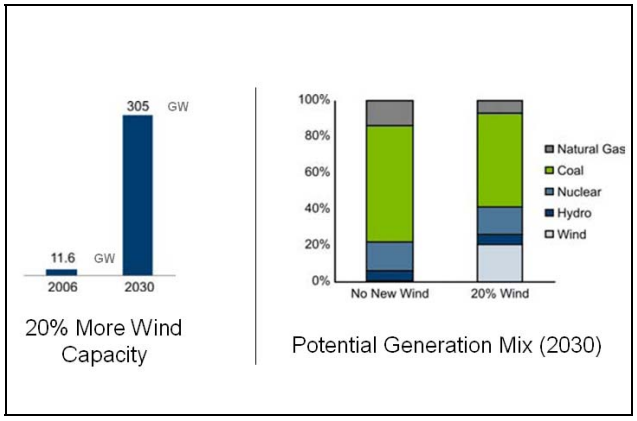


U.S. Wind Potential (50m above ground)

Source: DOE 20% Wind Energy by 2030

Through DOE's wind energy program, competitively selected, cost-shared research and development projects are addressing the barriers to operability, reliability and storage needed to bring wind's costs down further and enable even greater industry growth. Much of the wind industry's current success is attributable to the research conducted by

the National Wind Technology Center funded by DOE and located at the National Renewable Energy Laboratory in Golden, Colorado. Research at the Center has led to the development of multi-megawatt wind turbines that produce electricity at a cost that is starting to compete with conventional energy sources. To make wind energy fully cost-competitive and increase wind energy development, researchers at the Center are working with industry to develop larger, more efficient, utility-scale wind turbines for land-based and for offshore installations, as well as more efficient and quiet small wind turbines for distributed applications.



Wind Generation in 2030
Source: 20% Wind Energy by 2030

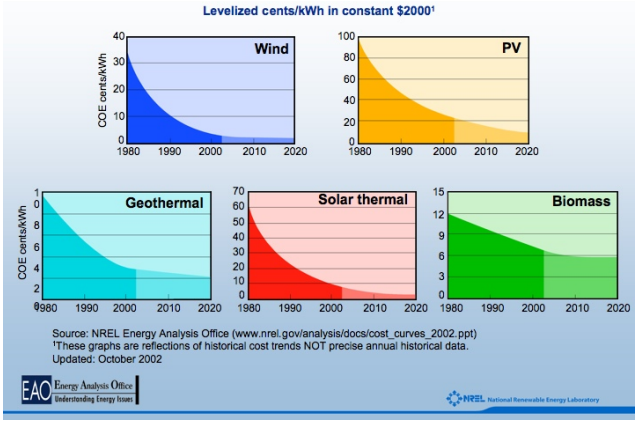
Today, about half of the States have established requirements for minimum generation of electricity with renewables ("Renewable Portfolio Standards"), which mandate demand, and thereby encourage supply. Since the Energy Policy Act of 1992, the Federal Government has provided a subsidy for electricity produced with wind energy. The current subsidy stands at about 2 cents per kilowatt-hour, which is equivalent to roughly 22 percent of the average delivered price of electricity in the United States. The benefits of this subsidy have created great incentives to install new wind generation capacity.

In May, 2008, the Department issued a report that examines the costs, challenges, and key impacts of an initiative to generate 20 percent of America's electricity from wind by 2030. This would require an increase from the current 11.5 GW to more than 300 GW of new wind capacity over the next 22 years. While technically feasible, there are significant transmission construction and grid operation issues that must be addressed, in addition to materials, manufacturing, and labor challenges. Nevertheless, wind generation is becoming a mature technology that will certainly make a substantial contribution to the future generation mix.

SOLAR

In the area of solar power, DOE is pursuing a two-pronged approach to reducing cost. The Department is funding aggressive and innovative R&D programs – many in partnership with industry and universities. In March 2008, DOE announced that it will invest up to $13.7 million over three years for 11 university-led projects focused on developing advanced solar photovoltaic (PV) technology manufacturing processes and products. These projects are integral to the Solar America Initiative, which aims to make solar energy cost-competitive with conventional forms of electricity by 2015.

On May 29, 2008, DOE and the U.S. Department of the Interior announced its intent to prepare an environmental impact statement (EIS) to evaluate solar energy development and implement agency-specific programs. These programs would facilitate environmentally responsible utility-scale solar energy development by establishing environmental policies and mitigation strategies related to solar energy development in six western states (Arizona, California, Colorado, New Mexico, Nevada, and Utah). The study area has been limited to these six states based on initial resource assessment showing they encompass the most prospective solar energy resources suitable for utility-scale development over the next 20 years. The draft EIS is scheduled for release in the spring of 2009.



Renewable Electricity Cost Trends

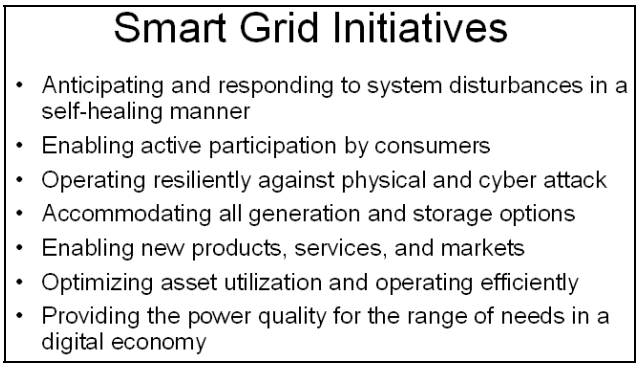
HYDROELECTRIC POWER

The United States has already developed its hydroelectric resources, which continue to provide clean power to our grid, and currently comprise over 6 percent of our total electricity. However, no new large dams are expected to be constructed. However, DOE continues research on conventional hydropower technologies and on innovative hydro technologies, such as ocean thermal energy conversion and wave power. These resources, collectively called "hydrokinetic energy," have the potential to bring about a substantial increase in the future use of hydropower.

It is clear from the wind and solar examples that past federal support for energy R&D, and policies and regulations to support deployment of promising technologies, as well as tax incentives, are bearing fruit. It is also clear that DOE can and must do more, not only in aggressive R&D, but also in terms of predictable and durable policies to encourage greater private sector investment, and not just for renewables.

SMART GRID

Smart grid technology is another example of how DOE is attempting to improve and enhance the delivery of clean electricity to the national grid.



Its purpose is to implement advances in digital and information technology for enhanced operational monitoring, control, intelligence, and connectivity of the bulk U.S. electricity delivery network. The enhanced capabilities of a smart grid can greatly improve the reliability, security, economy, and efficiency of the electric grid, while minimizing its environmental impact.

STORAGE

One of the great advances in electricity will be the ability to utilize low-cost electricity storage, particularly for system balancing, to meet peak loads, and to provide voltage support. According to the Energy Information Administration, there are 39 domestic pumped-hydro storage facilities operating in the United States in 2006. However, only a few locations are being considered for additional pumped-hydro storage facilities.

The United States has been funding extensive non-hydro storage research, often in programs that share costs with States or utilities. Promising innovations include vanadium redox flow and sodium sulfur batteries, flywheels, compressed air, super-capacitors, and thermal storage in salts. As significant numbers of "plug-in hybrid" electric vehicles enter the U.S. car fleet, there appears to be exciting opportunity for programs that could utilize the energy stored in these batteries during periods of peak demand to send power back to the grid, rather than use natural gas peaking units.

ELECTRICITY PLANNING CHALLENGES

Clearly, the electricity industry and regulators in the United States face difficulties in evaluating and planning demand, supply, and transmission needs for a city, a State, or a region. Not only are future carbon and environmental costs uncertain, so is the future of government mandates for use of renewable energy. There is internal debate in the United States regarding the imposition of renewable portfolio standards for electricity providers. At the moment, there is significant opposition from areas of the country that lack abundant wind or solar resources. Nevertheless, like the national carbon emissions reduction proposals, national renewable portfolio standards will continue to be debated by the next Congress.

With regard to transmission, today's pattern of siting much generation distant from consumers – which can often be in another State – will continue for the foreseeable future. Therefore, State-level planning needs to be followed by regional-scale planning and coordination. After considering and defining their future electricity objectives,

strengths, and needs, States need to discuss with their neighbors some basic questions concerning the mix and locations of the region's generation resources, including what transmission facilities are required and where, how urban areas should strike an appropriate balance between local generation, energy efficiency programs, and imports via transmission. America will benefit when states in a region work in a cooperative and coordinated fashion to bring that shared view to reality.

The Western Renewable Energy Zone project recently announced by DOE is projected to bolster the growth of renewable energy sources, increase regional electricity planning among the Western States, and foster an open stakeholder process to develop transmission plans for the delivery of these resources.

Finally on the Federal side, the Department continues to invest heavily in the research and development of a wide range of advanced clean energy technologies, including clean coal technologies with Carbon Capture and Sequestration, next generation nuclear reactors, and energy efficiency and related demand side technologies. Indeed, the demand-side measures, such as conservation and increased efficiency, are often cheaper and can be implemented much faster than supply side resources. Maturation of these efforts, advancement of technologies and their increased market penetration, and modernization of the existing electricity transmission and distribution infrastructure are critical components of President Bush's vision of a cleaner, more secure energy future.

It is clear that meeting our future electricity needs will not occur overnight or by a single solution or approach. New demand will be met only through National and regional cooperation on a combination of all of the options that address both supply and demand. While the technical hurdles to continued reliable electric service are considerable, they must and will be overcome. As we move toward that secure energy future, renewable energy will play a leading role in helping to reach our goal of a clean and diverse fuel mix for the United States.